

Pressure Measurement

Single-range transmitters for general applications

SITRANS LH100 Transmitter for hydrostatic level

1

Overview



The pressure transmitter SITRANS LH100 is a submersible sensor for hydrostatic level measurement.

The pressure transmitter measures the liquid levels in tanks, containers, channels and dams. The SITRANS LH100 pressure transmitters are available for various measuring ranges and with explosion protection as an option.

A junction box and a cable hanger are available as accessories for simple installation.

Benefits

- Compact design
- Simple installation
- Small error in measurement (0.3 %)
- Degree of protection IP68

Application

SITRANS LH100 pressure transmitters are used in the following branches, for example:

- Shipbuilding
- Water/waste water supply
- For use in unpressurized/open vessels and wells

Design

The pressure transmitter has a built-in ceramic sensor which is equipped with a Wheatstone resistance bridge.

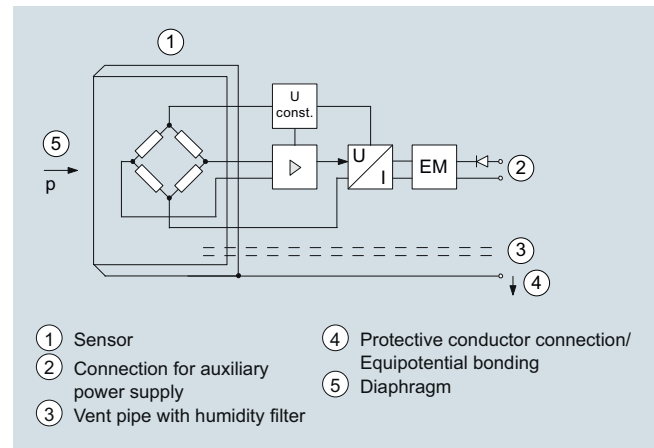
These pressure transmitters are equipped with an electronic circuit fitted together with the sensor in a stainless steel housing. In addition, the connecting cable contains a vent pipe which is equipped with a humidity filter to prevent the build-up of condensation.

The diaphragm is protected against external influences by a protective cap.

The sensor, the electronics and the connecting cable are housed in an enclosure with small dimensions.

The pressure transmitter is temperature-compensated for a wide temperature range.

Function



SITRANS LH100 pressure transmitter, mode of operation and connection diagram

On one side of the sensor (1), the diaphragm (5) is exposed to the hydrostatic pressure which is proportional to the submersion depth. This pressure is compared with atmospheric pressure. Pressure compensation is carried out using the vent pipe (3) in the connecting cable. The vent pipe is equipped with a humidity filter which prevents the build-up of condensation in the vent pipe.

The hydrostatic pressure of the liquid column acts on the diaphragm of the sensor and transmits the pressure to the Wheatstone resistance bridge in the sensor.

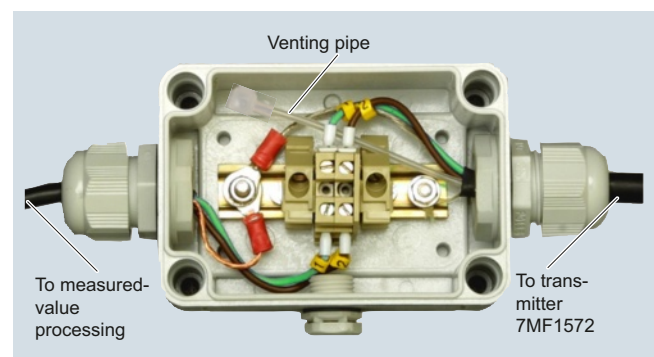
The output voltage of the sensor is applied to the electronic circuit where it is converted into an output current of 4 to 20 mA.

The protective conductor connection/equipotential bonding (4) is connected to the enclosure.

Integration

It is generally recommended that the connecting cable of the SITRANS LH100 transmitter is connected to the junction box, which can be ordered separately, and secured with the cable hanger, also available separately. The junction box has to be installed near the measuring point.

If the medium is anything other than water, it is also necessary to check compatibility with the specified materials of the transmitter.



Junction box 7MF1572-8AA, open, schematic diagram

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Measuring point setup, generally with junction box 7MF1572-8AA and 7MF1572-8AB cable hanger

Technical specifications

Pressure transmitter SITRANS LH100 (submersible sensor)

Mode of operation

Measuring principle piezo-resistive

Input

Measured variable Hydrostatic level

Measuring range

Measured variable	Max. permissible operating pressure
• 0 ... 3 mH ₂ O (0 ... 9 ftH ₂ O)	• 1.5 bar (21.8 psi) (corresponds to 15 mH ₂ O (45 ftH ₂ O))
• 0 ... 4 mH ₂ O (0 ... 12 ftH ₂ O)	• 1.5 bar (21.8 psi) (corresponds to 15 mH ₂ O (45 ftH ₂ O))
• 0 ... 5 mH ₂ O (0 ... 15 ftH ₂ O)	• 1.5 bar (21.8 psi) (corresponds to 15 mH ₂ O (45 ftH ₂ O))
• 0 ... 6 mH ₂ O (0 ... 18 ftH ₂ O)	• 1.5 bar (21.8 psi) (corresponds to 15 mH ₂ O (45 ftH ₂ O))
• 0 ... 10 mH ₂ O (0 ... 30 ftH ₂ O)	• 3.0 bar (43.5 psi) (corresponds to 30 mH ₂ O (90 ftH ₂ O))
• 0 ... 20 mH ₂ O (0 ... 60 ftH ₂ O)	• 5.0 bar (72.5 psi) (corresponds to 50 mH ₂ O (150 ftH ₂ O))
• 0 ... 0.3 bar	• 1.5 bar
• 0 ... 0.4 bar	• 1.5 bar
• 0 ... 0.5 bar	• 1.5 bar
• 0 ... 0.6 bar	• 1.5 bar
• 0 ... 1 bar	• 3.0 bar
• 0 ... 2 bar	• 5.0 bar

Output

Output signal 4 ... 20 mA

Measuring accuracy

According to IEC 60770-1

Error in measurement at limit setting including hysteresis and reproducibility 0.3% of full-scale value (typical)

Measuring range

• 0 ... 3 mH ₂ O (0 ... 9 ftH ₂ O bzw. 0 ... 0.3 bar)	0.5 % of full-scale value (typical)
• For all other measuring ranges	0.3 % of full-scale value (typical)

Influence of ambient temperature

Measuring range

Measuring range	Zero and span
• 3 mH ₂ O (9 ftH ₂ O or 0.3 bar)	0.5 %/10 K of full-scale value
• 4 ... 6 mH ₂ O (12 ... 18 ftH ₂ O or 0.4...0.6 bar)	0.45 %/10 K of full-scale value
• > 6 mH ₂ O (> 18 ftH ₂ O or > 0.6 bar)	0.3 %/10 K of full-scale value

Long-term stability

Measuring range

Measuring range	Zero and span
• 3 mH ₂ O (9 ftH ₂ O or 0.3 bar)	0.4 % of full-scale value/year
• 4 ... 6 mH ₂ O (12 ... 18 ftH ₂ O or 0.4...0.6 bar)	0.25% of full-scale value/year
• > 6 mH ₂ O (> 18 ftH ₂ O or > 0.6 bar)	0.2 % of full-scale value/year

Rated conditions

Ambient conditions

• Process temperature	-10 ... +80 °C (14 ... 176 °F)
• Storage temperature	-40 ... +80 °C (-40 ... +176 °F)

Degree of protection according to IEC 60529

IP68

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Design

Weight	≈ 0.2 kg (≈ 0.44 lb)
• Pressure transmitter	≈ 0.2 kg (≈ 0.44 lb)
• Cable	0.025 kg/m (≈ 0.015 lb/ft)
Electrical connection	Cable with 3 conductors, vent pipe and integrated humidity filter
Material	
• Seal diaphragm	Al ₂ O ₃ ceramic, 96%
• Enclosure	Stainless steel, mat. no. 1.4404/316L
• Gasket	FPM (standard)
	EPDM (optional)
	PE-HD (standard)
• Connecting cable	PE-LD (in the case of versions with EPDM seal, suitable for drinking water)

Auxiliary power

Terminal voltage on pressure transmitter U_B	10 ... 33 V DC
	10 ... 30 V DC for transmitter with intrinsic safety explosion protection

Certificates and approvals

Drinking water approval (ACS)	Applied for
Drinking water approval (WRAS)	1403525
EAC	№ TC RU C-DE.ГБ05.В.00732 ОС НАННО «ЦСВЭ»
Underwriters Laboratories (UL)	2014-11-17 - E344532
The transmitter is not subject to the pressure equipment directive (PED 97/23/EC)	
Explosion protection	
• Intrinsic safety "i"	IECEx SEV 14.0003 SEV 14 ATEX 0109
- Marking	II 1 G Ex ia IIC T4 Ga

Junction box

Application	for connecting the transmitter cable
Design	
Weight	0.2 kg (0.44 lb)
Electrical connection	2 x 3-way (28 to 18 AWG)
Cable entry	2 x Pg 9
Enclosure material	polycarbonate
Vent pipe for atmospheric pressure	
Screw for cable strength cord	
Rated conditions	
Degree of protection according to IEC 60529	IP65

Cable hanger

Application	for mounting the transmitter
Design	
Weight	0.16 kg (0.35 lb)
Material	Galvanized steel, polyamide

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<p>Measuring range Cable length</p> <table border="0"> <tr><td>0 ... 3 mH₂O¹⁾</td><td>10 m</td><td>▶</td><td>1 C</td></tr> <tr><td>0 ... 4 mH₂O</td><td>10 m</td><td>▶</td><td>1 D</td></tr> <tr><td>0 ... 5 mH₂O</td><td>10 m</td><td>▶</td><td>1 E</td></tr> <tr><td>0 ... 6 mH₂O</td><td>10 m</td><td>▶</td><td>1 F</td></tr> <tr><td>0 ... 10 mH₂O</td><td>20 m</td><td>▶</td><td>1 H</td></tr> <tr><td>0 ... 20 mH₂O</td><td>30 m</td><td>▶</td><td>1 K</td></tr> <tr><td>0 ... 9 ftH₂O¹⁾</td><td>33 ft</td><td></td><td>2 C</td></tr> <tr><td>0 ... 12 ftH₂O</td><td>33 ft</td><td></td><td>2 D</td></tr> <tr><td>0 ... 15 ftH₂O</td><td>33 ft</td><td></td><td>2 E</td></tr> <tr><td>0 ... 18 ftH₂O</td><td>33 ft</td><td></td><td>2 F</td></tr> <tr><td>0 ... 30 ftH₂O</td><td>66 ft</td><td></td><td>2 H</td></tr> <tr><td>0 ... 60 ftH₂O</td><td>98 ft</td><td></td><td>2 K</td></tr> <tr><td>0 ... 0.3 bar¹⁾</td><td>10 m</td><td></td><td>3 C</td></tr> <tr><td>0 ... 0.4 bar</td><td>10 m</td><td></td><td>3 D</td></tr> <tr><td>0 ... 0.5 bar</td><td>10 m</td><td></td><td>3 E</td></tr> <tr><td>0 ... 0.6 bar</td><td>10 m</td><td></td><td>3 F</td></tr> <tr><td>0 ... 1 bar</td><td>20 m</td><td></td><td>3 H</td></tr> <tr><td>0 ... 2 bar</td><td>30 m</td><td></td><td>3 K</td></tr> </table> <p>Special versions: Measuring ranges for special versions between 0 ... 3 mH₂O and 0 ... 30 mH₂O or 0 ... 9 ftH₂O and 0 ... 90 ftH₂O or 0 ... 0.3 bar and 0 ... 3 bar possible.</p> <p>Special cable length/Special measuring range Please add „-Z“ to Article No. and specify Order code and plain text. Note: Indication of measuring range Y01 is always necessary.</p> <p>For evaluation of the maximum possible cable length following data have to be regarded: Transmitter: $C_i = 0 \mu\text{F}$, $L_i = 0 \mu\text{H}$ Cable: $C_k = 0,19 \text{ nF}$ per meter cable $L_k = 1,5 \mu\text{H}$ per meter cable The maximum permitted data of the transmitter's power supply have to be considered!</p> <table border="0"> <tr><td>3 m (10 ft)</td><td>H 1 A</td></tr> <tr><td>5 m (16 ft)</td><td>H 1 B</td></tr> <tr><td>7 m (23 ft)</td><td>H 1 C</td></tr> <tr><td>10 m (33 ft)</td><td>H 1 D</td></tr> <tr><td>15 m (49 ft)</td><td>H 1 E</td></tr> <tr><td>20 m (66 ft)</td><td>H 1 F</td></tr> <tr><td>25 m (82 ft)</td><td>H 1 G</td></tr> <tr><td>30 m (98 ft)</td><td>H 1 H</td></tr> <tr><td>40 m (131 ft)</td><td>H 1 J</td></tr> <tr><td>50 m (164 ft)</td><td>H 1 K</td></tr> <tr><td>60 m (198 ft)¹⁾</td><td>H 1 L</td></tr> <tr><td>70 m (231 ft)¹⁾</td><td>H 1 M</td></tr> <tr><td>80 m (264 ft)¹⁾</td><td>H 1 N</td></tr> <tr><td>90 m (297 ft)¹⁾</td><td>H 1 P</td></tr> <tr><td>100 m (330 ft)¹⁾</td><td>H 1 Q</td></tr> </table>			0 ... 3 mH ₂ O ¹⁾	10 m	▶	1 C	0 ... 4 mH ₂ O	10 m	▶	1 D	0 ... 5 mH ₂ O	10 m	▶	1 E	0 ... 6 mH ₂ O	10 m	▶	1 F	0 ... 10 mH ₂ O	20 m	▶	1 H	0 ... 20 mH ₂ O	30 m	▶	1 K	0 ... 9 ftH ₂ O ¹⁾	33 ft		2 C	0 ... 12 ftH ₂ O	33 ft		2 D	0 ... 15 ftH ₂ O	33 ft		2 E	0 ... 18 ftH ₂ O	33 ft		2 F	0 ... 30 ftH ₂ O	66 ft		2 H	0 ... 60 ftH ₂ O	98 ft		2 K	0 ... 0.3 bar ¹⁾	10 m		3 C	0 ... 0.4 bar	10 m		3 D	0 ... 0.5 bar	10 m		3 E	0 ... 0.6 bar	10 m		3 F	0 ... 1 bar	20 m		3 H	0 ... 2 bar	30 m		3 K	3 m (10 ft)	H 1 A	5 m (16 ft)	H 1 B	7 m (23 ft)	H 1 C	10 m (33 ft)	H 1 D	15 m (49 ft)	H 1 E	20 m (66 ft)	H 1 F	25 m (82 ft)	H 1 G	30 m (98 ft)	H 1 H	40 m (131 ft)	H 1 J	50 m (164 ft)	H 1 K	60 m (198 ft) ¹⁾	H 1 L	70 m (231 ft) ¹⁾	H 1 M	80 m (264 ft) ¹⁾	H 1 N	90 m (297 ft) ¹⁾	H 1 P
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<p>Sealing material between sensor and enclosure</p> <ul style="list-style-type: none"> • FPM (Standard) ▶ 1 • EPDM (for drinking water applications) ▶ 2 		
<p>Explosion protection</p> <ul style="list-style-type: none"> • without ▶ 0 • With ATEX II1 G Ex ia IIC T4 Ga and IECEx Ex ia IIC T4 Ga ▶ 1 		
<p>Additional versions</p> <p>Quality inspection certificate (factory calibration) acc. to IEC 60770-2, add "-Z" to article no. and add order code.</p> <p>Indication of measuring range (only at special cable lengths) in "... to ... mH₂O" or "... to ... ftH₂O" or "... to ... bar"</p>	Order code	C11 Y01
<p>Accessories/spare parts</p> <p>Junction box ▶ for connecting the transmitter cable</p> <p>Cable hanger ▶ for securing the pressure transmitter</p> <p>Protective caps as spare parts (10-pack) ▶</p> <p>Humidity filters as spare parts (10-pack) ▶</p>	Article No.	7MF1572-8AA 7MF1572-8AB 7MF1572-8AD 7MF1572-8AE

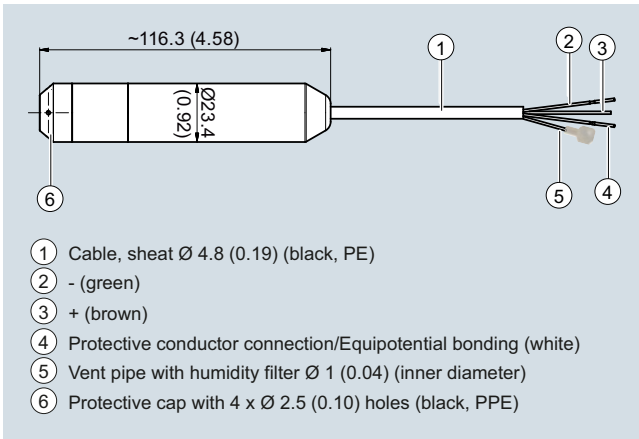
▶ Available ex stock
1) Approvals pending.

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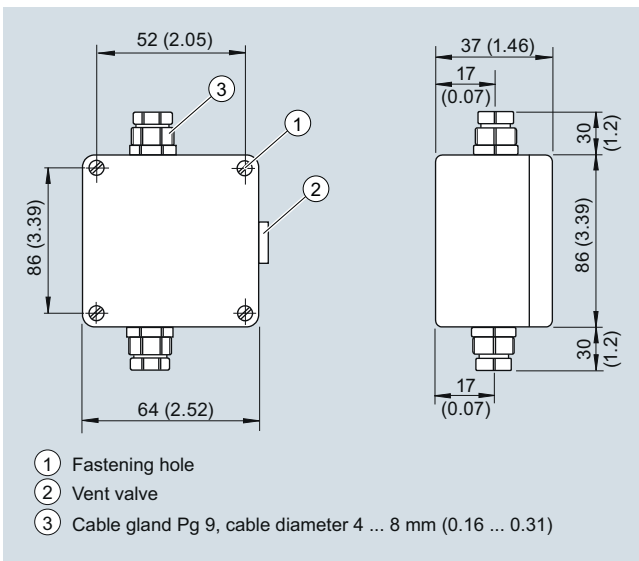
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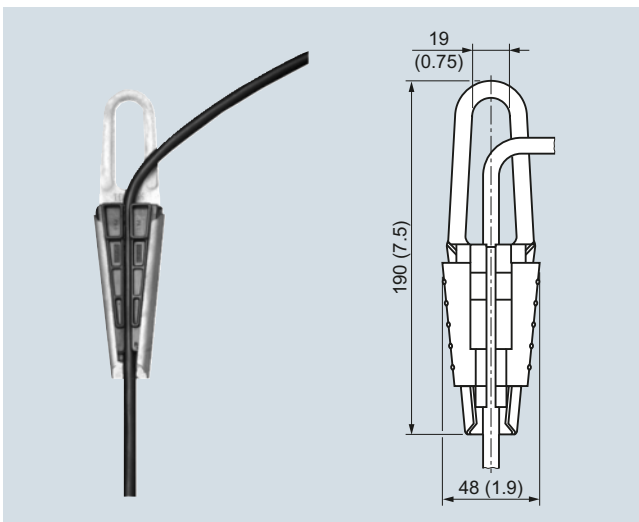
Dimensional drawings



SITRANS LH100 pressure transmitter, dimensions in mm (inch)



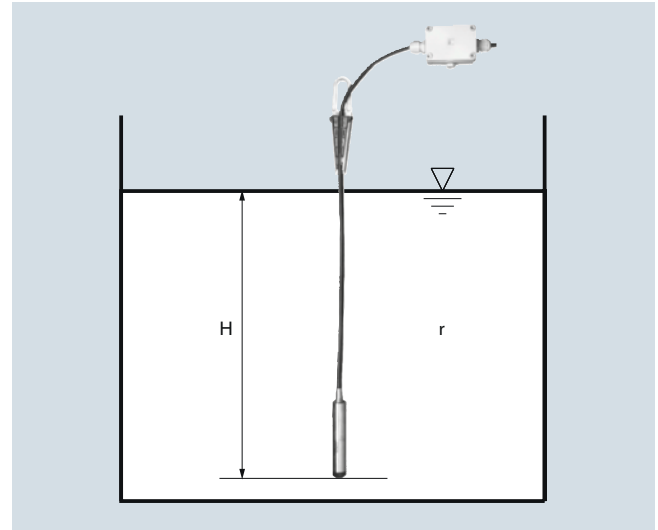
Junction box, dimensions in mm (inch)



Cable hanger, dimensions in mm (inch)

More information

Determination of the measuring range for media with a density of $\neq 1000 \text{ kg/m}^3$ (medium \neq water)



Calculation of the measuring range:

$$p = \rho \times g \times H$$

with:

ρ = density of medium

g = local acceleration due to gravity

H = maximum level

Example:

Medium: Diesel fuel, $\rho = 850 \text{ kg/m}^3$

Acceleration due to gravity: 9.81 m/s^2

Start-of-scale: 0 m

Maximum level: 6.0 m

Cable length: 10 m

Calculation:

$$p = 850 \text{ kg/m}^3 \times 9.81 \text{ m/s}^2 \times 6.0 \text{ m}$$

$$p = 50\,031 \text{ N/m}^2$$

$$p = 500 \text{ mbar}$$

Transmitter to be ordered:

7MF1572-1FA11

Plus, if required, junction box 7MF1572-8AA and cable hanger 7MF1572-8AB